

IN THE CLAIMS:

Claim 1 (currently amended): A semiconductor photodetection device, comprising:

a semiconductor substrate of a first conductivity type;

a photodetection layer formed on said semiconductor substrate;

a region of a second conductivity type opposite to said first conductivity type being formed in a part of said photodetection layer; and

an electrode applying an electric field to said photodetection layer via said region of said second conductivity type such that said electric field acts in a thickness direction of said photodetection layer,

said photodetection layer comprising: a first semiconductor layer having a first thickness and accumulating therein a compressive strain and absorbing an optical radiation; and a second semiconductor layer having a second thickness smaller than said first thickness and accumulating therein a tensile strain, said first semiconductor layer and said second semiconductor layer being stacked alternately and repeatedly in said photodetection layer,

wherein said tensile strain in said second semiconductor layer has a magnitude larger than a magnitude of said compressive strain in said first semiconductor layer,

said first compressive strain in said first semiconductor layer has a magnitude exceeding 0.25%

wherein a sum of the second thicknesses of said second semiconductor layers is smaller than a sum of the first and second thicknesses by a factor of $(0.9 \times L^{1/4} \times \epsilon)$, wherein ϵ represents the strain accumulated in said first semiconductor layer in terms of percent and L represents a sum

of a total thickness of said first semiconductor layers in said photodetection layer and a total thickness of said second semiconductor layers in said photodetection layer in terms of microns;
said strain ϵ being set so as to achieve an optical absorption efficiency η of at least 50 %
when an optical radiation having a wavelength of 1620nm comes in at a temperature of -40 °C.

Claim 2 (Currently amended): A semiconductor photodetection device as claimed in claim 1, wherein said first semiconductor layer accumulates therein a strain ~~of 0.2% or more~~ but not exceeding 0.6%.

Claim 3 (original): A semiconductor photodetection device as claimed in claim 1, wherein said first semiconductor layer has a thickness of 50 nm or more.

Claim 4 (canceled)

Claim 5 (original): A semiconductor photodetection device as claimed in claim 3, wherein the second thickness of the second semiconductor layer is smaller than one-half the first thickness of the first semiconductor layer.

Claim 6 (canceled):

Claim 7 (original): A semiconductor photodetection device as claimed in claim 1, wherein

each of said first and second semiconductor layers comprises a ternary compound semiconductor material.

Claim 8 (canceled):

Claim 9 (original): A semiconductor photodetection device as claimed in claim 1, wherein said substrate comprises n-type InP and said first and second semiconductor layers comprise n-type InGaAs.

Claim 10 (canceled):

Claim 11 (original): A semiconductor photodetection device as claimed in claim 1, further comprising an intermediate layer between said first and second semiconductor layers, said intermediate layer having an intermediate bandgap between a bandgap of said first semiconductor layer and a bandgap of said second semiconductor layer.

Claim 12 (Canceled):

Claim 13 (original): A semiconductor photodetection device as claimed in claim 11, wherein said intermediate layer is provided at a side of said first semiconductor layer closer to said region of said second conductivity type.

Claim 14 (original): A semiconductor photodetection device as claimed in claim 11, wherein said intermediate layer has a composition profile that changes gradually in a thickness direction thereof.

Claim 15 (original): A semiconductor photodetection device as claimed in claim 14, wherein said intermediate layer accumulates a tensile strain at a side thereof contacting said second semiconductor layer and a compressive strain at a side thereof contacting said first semiconductor layer.

Claim 16 (withdrawn): A fabrication process of a semiconductor photodetection device, comprising the steps of:

forming a photodetection layer on a semiconductor substrate by alternately and repeatedly forming a first semiconductor layer and a second semiconductor layer on said semiconductor substrate while changing a flow-rate of source gases without interrupting a supply thereof; and

forming an electrode on said photodetection layer so as to apply an electric field in a thickness direction of said photodetection layer,

said first semiconductor layer being formed of a ternary compound semiconductor material having a lattice constant different from a lattice constant of said substrate and accumulating therein a compressive strain, said second semiconductor layer being formed of a ternary compound semiconductor material having a lattice constant different from said lattice constant of said

substrate and accumulating therein a tensile strain.

Claim 17 (withdrawn): A method as claimed in claim 16, wherein said steps of forming said first semiconductor layer and said second semiconductor layer being conducted alternately by an MOVPE process while changing a flow-rate of metal organic sources continuously.

Claim 18 (currently amended): A semiconductor photodetection device, comprising:

- a semiconductor substrate of a first conductivity type;
- a photodetection layer formed on said semiconductor substrate;
- a region of a second conductivity type opposite to said first conductivity type being formed in a part of said photodetection layer; and
- an electrode applying an electric field to said photodetection layer via said region of said second conductivity type such that said electric field acts in a thickness direction of said photodetection layer,

said photodetection layer comprising: a first semiconductor layer having a first thickness and accumulating therein a compressive strain and absorbing an optical radiation; and a second semiconductor layer having a second thickness smaller than said first thickness and accumulating therein a tensile strain, said first semiconductor layer and said second semiconductor layer being stacked alternately and repeatedly in said photodetection layer,

wherein said tensile strain in said second semiconductor layer has a magnitude larger than a magnitude of said compressive strain in said first semiconductor layer; and

wherein a total thickness of said first and second semiconductor layers is less than $1.5\text{ }\mu\text{m}$,

said first compressive strain in said first semiconductor layer having a magnitude exceeding 0.25%,

wherein a sum of the second thicknesses of said second semiconductor layers is smaller than a sum of the first and second thicknesses by a factor of $(0.9 \times L^{1/4} \times \epsilon)$, wherein ϵ represents the strain accumulated in said first semiconductor layer in terms of percent and L represents a sum of a total thickness of said first semiconductor layers in said photodetection layer and a total thickness of said second semiconductor layers in said photodetection layer in terms of microns;

said strain ϵ being set so as to achieve an optical absorption efficiency η of at least 50% when an optical radiation having a wavelength of 1620nm comes in at a temperature of -40°C .

Claim 19 (currently amended): A semiconductor photodetection device, comprising:

- a semiconductor substrate of a first conductivity type;
- a photodetection layer formed on said semiconductor substrate;
- a region of a second conductivity type opposite to said first conductivity type being formed in a part of said photodetection layer; and
- an electrode applying an electric field to said photodetection layer via said region of said second conductivity type such that said electric field acts in a thickness direction of said photodetection layer,

said photodetection layer comprising: a first semiconductor layer having a first thickness and accumulating therein a compressive strain and absorbing an optical radiation; and a second semiconductor layer having a second thickness smaller than said first thickness and accumulating therein a tensile strain, said first semiconductor layer and said second semiconductor layer being stacked alternately and repeatedly in said photodetection layer,

wherein said tensile strain in said second semiconductor layer has a magnitude larger than a magnitude of said compressive strain in said first semiconductor layer, and

wherein said first semiconductor layer has a thickness incrementally and inclusively beginning from 50nm and ending at less than 80nm,

said first compressive strain in said first semiconductor layer having a magnitude exceeding 0.25%,

wherein a sum of the second thicknesses of said second semiconductor layers is smaller than a sum of the first and second thicknesses by a factor of $(0.9 \times L^{1/4} \times \epsilon)$, wherein ϵ represents the strain accumulated in said first semiconductor layer in terms of percent and L represents a sum of a total thickness of said first semiconductor layers in said photodetection layer and a total thickness of said second semiconductor layers in said photodetection layer in terms of microns.

said strain ϵ being set so as to achieve an optical absorption efficiency η of at least 50% when an optical radiation having a wavelength of 1620nm comes in at a temperature of -40°C.

Claim 20 (currently amended): A semiconductor photodetection device, comprising:

a semiconductor substrate of a first conductivity type;
a photodetection layer formed on said semiconductor substrate;
a region of a second conductivity type opposite to said first conductivity type being formed
in a part of said photodetection layer; and

an electrode applying an electric field to said photodetection layer via said region of said
second conductivity type such that said electric field acts in a thickness direction of said
photodetection layer,

said photodetection layer comprising: a first semiconductor layer having a first thickness
and accumulating therein a compressive strain and absorbing an optical radiation; and a second
semiconductor layer having a second thickness smaller than said first thickness and accumulating
therein a tensile strain, said first semiconductor layer and said second semiconductor layer being
stacked alternately and repeatedly in said photodetection layer,

wherein said tensile strain in said second semiconductor layer has a magnitude larger than
a magnitude of said compressive strain in said first semiconductor layer, and

wherein said first semiconductor layer has a thickness greater than 80nm,

said first compressive strain in said first semiconductor layer having a magnitude
exceeding 0.25%,

wherein a sum of the second thicknesses of said second semiconductor layers is smaller
than a sum of the first and second thicknesses by a factor of $(0.9 \times L^{1/4} \times \varepsilon)$, wherein ε represents
the strain accumulated in said first semiconductor layer in terms of percent and L represents a sum

of a total thickness of said first semiconductor layers in said photodetection layer and a total thickness of said second semiconductor layers in said photodetection layer in terms of microns;

said strain ϵ being set so as to achieve an optical absorption efficiency η of at least 50% when an optical radiation having a wavelength of 1620nm comes in at a temperature of -40°C.